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(54) **A speech facility for a face mask**

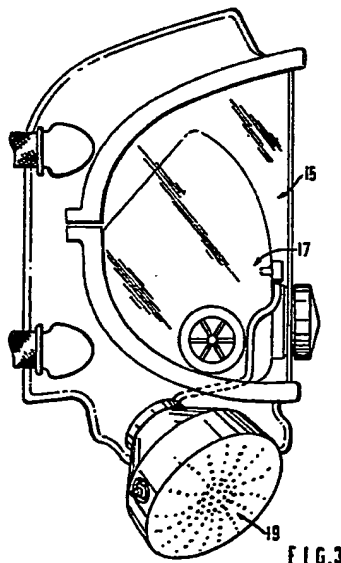
(57) A method and apparatus for imparting a speech facility to a face mask or the like in order to reproduce outside the mask the voice of a wearer.

Electronic circuitry 31 is employed in conjunction with a microphone 35 and a speaker 25 to reproduce the voice of the wearer. By using electronics incorporating an amplifier, the desired output sound level can be achieved without the need for the wearer to shout.

The electronic components are accommodated within an air tight casing 21 which is adapted to be secured to the mask in an air tight manner. An air tight membrane 27 is provided over the speaker and forms part of the air tight casing.

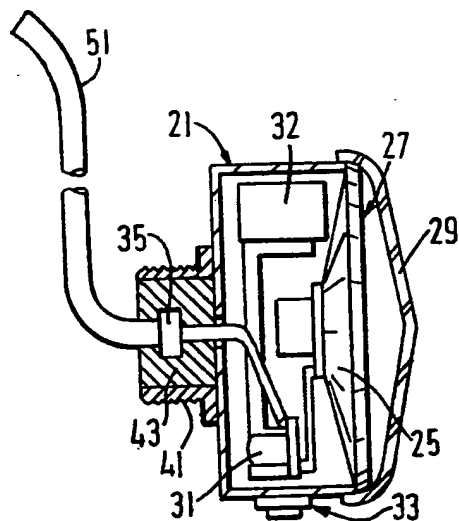
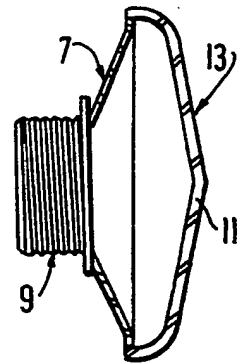
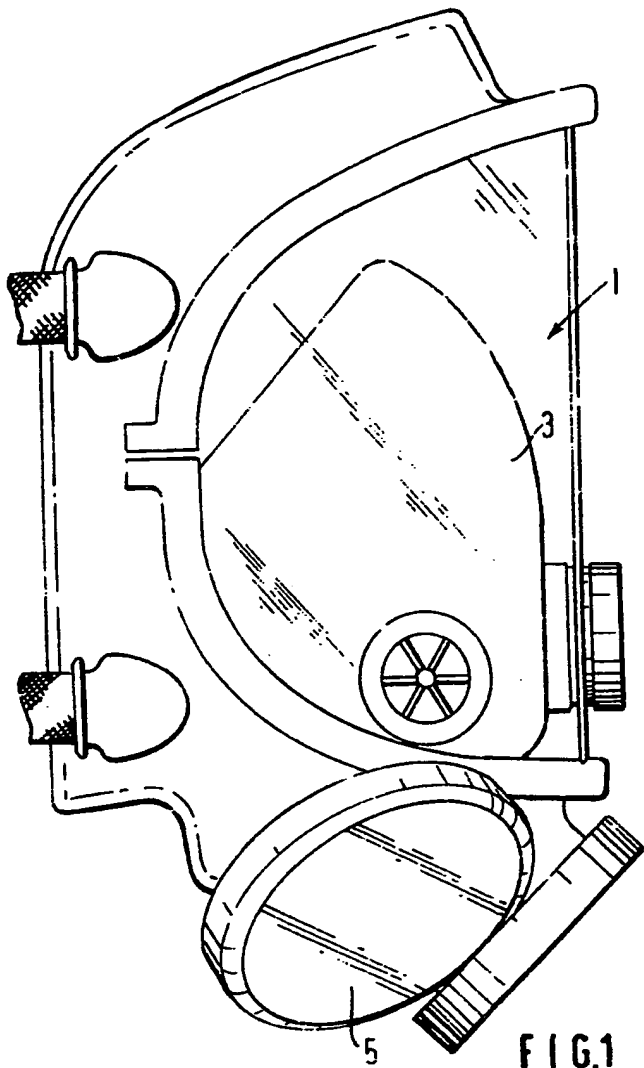
In one embodiment the microphone 35 is disposed within the face mask and connected to the electronics by wires.

In another embodiment, the wearers voice is communicated to the microphone by way of a sound transmission tube which extends from the apparatus into the face mask.



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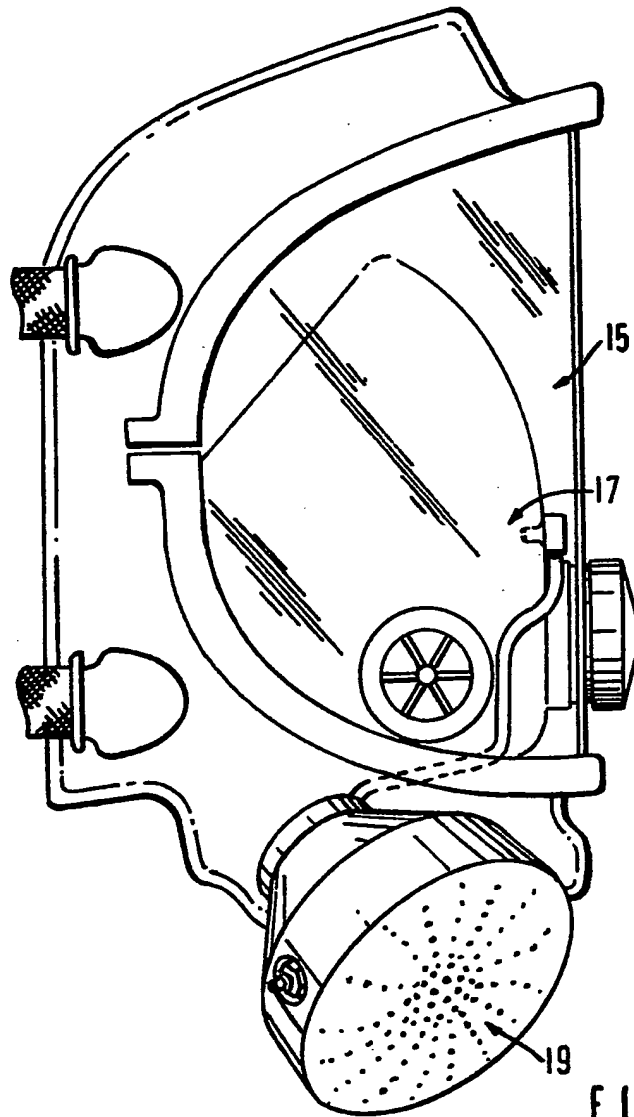


FIG. 3

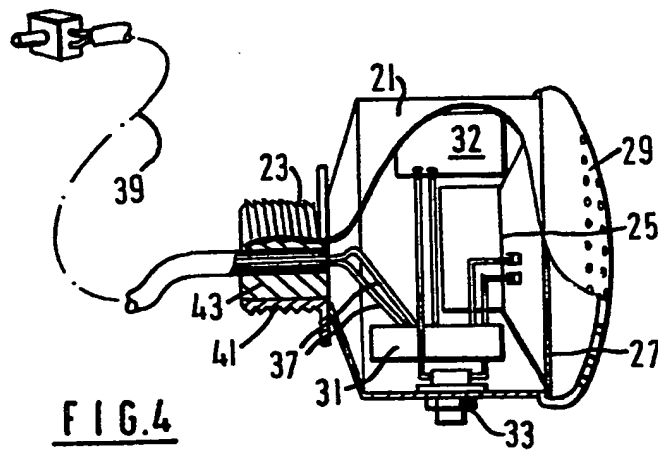


FIG. 4

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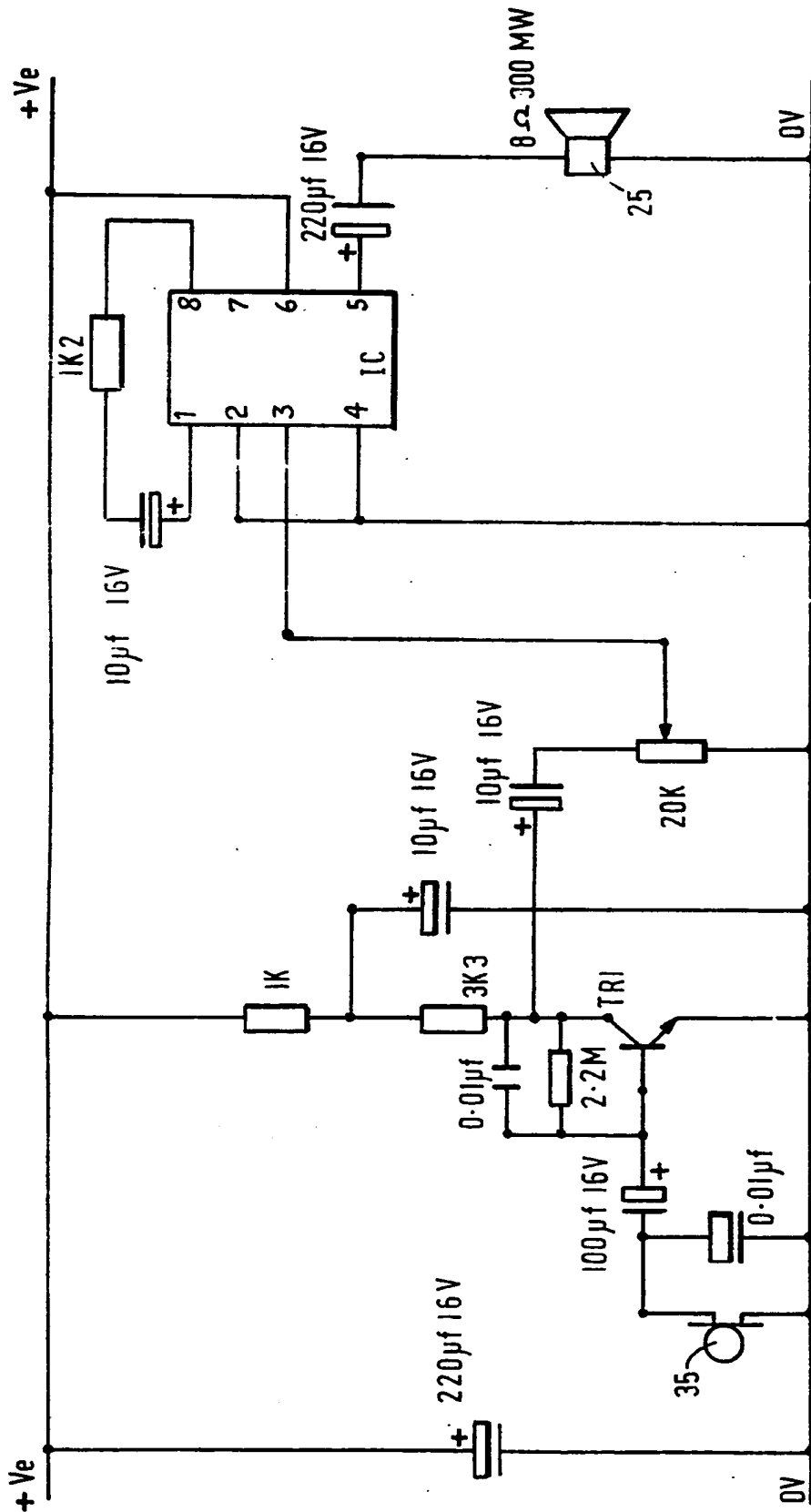


FIG. 6

## SPECIFICATION

### A speech facility for a face mask

5 The present invention relates to speech facility for use in industrial, commercial or military breathing apparatus, face masks, gas masks or respirators or any safety helmet where speech is impaired.

A known method of speech transmission in face masks used in irrespirable atmospheres is similar to that shown in Figure 1 and 2. Figure 1 shows a compressed air breathing apparatus face mask 1 having an inner oral-nasal mask 3 and speech facility apparatus 5. The speech facility apparatus is shown in further detail in Figure 2 which is a cross-section through the apparatus. It comprises a conical housing 7 which is attached to the mask 1 by a screw threaded fitting 9. Inside the cone and stretched over the wide end thereof is an airtight plastic membrane 11, this air tight membrane is protected by a perforated nylon cover 13. The sound is transmitted to the outside of the mask by sympathetic vibration of the plastic membrane 11 when the mask wearer speaks. This produces a distorted and poor sound quality, which the speaker 25 has to overcome by shouting. This puts an unnecessary strain on the mask wearer and is not an efficient way of communication when wearing face masks in hazardous or strenuous conditions.

It is an aim of the present invention to provide a speech facility for a face mask which avoids the above mentioned problems of the known apparatus, and which does not give rise to any operating restrictions.

The present invention provides a method of imparting a speech facility to a face mask or the like using an electronic circuit in conjunction with a battery microphone and speaker to reproduce the wearer voice from inside the mask to the outside.

Conveniently, the components are incorporated in a miniaturised assembly. More specifically the electronic circuitry incorporates an amplifier. The method enables the speakers voice to be reproduced outside of the mask without distortion or loss of volume, thus enabling the wearer to be clearly and audibly understood with the normal effort of speech.

45 According to the invention there is provided apparatus for use with a face mask or the like for imparting a speech facility to the mask, comprising an electronic circuit and a battery, a microphone and a speaker to reproduce the wearers voice from inside the mask to the outside.

The apparatus is conveniently incorporated in a miniaturised assembly and is readily adapted to be fitted to the face mask by way of a screw threaded connection. The screw threaded connection enables the apparatus to be completely detachable from the face mask. The electronic circuit incorporates an amplifier. Alternatively, the apparatus may be provided as an integral part of the face mask, thus avoiding the need for the screw threaded connection.

60 The voice of the wearer is picked up by the microphone and converted into an electronic signal by the electronic circuitry and then to an audible signal by

the speaker. The audible output from the speaker may be employed to vibrate an air tight membrane placed over the speaker or the speaker membrane itself may constitute the air tight seal. In one embodiment, the microphone is placed in the mask and preferably penetrates the oral-nasal mask. The electronic circuitry incorporates an amplifier and the resulting signal is relayed to the speaker and transmitted to the outside of the assembly through an air tight seal. Wires connect the microphone to the electronic circuitry. Conveniently, the wires from the microphone are disposed within a screening tube. The wires pass through the centre orifice of the screw threaded connection and at this point are surrounded by an air tight sound absorbing bung.

In a second embodiment, the microphone is disposed within the housing of the apparatus and sound from the wearer is transmitted to the microphone by way of a sound transmission tube. This passes through the screw threaded connection and leads into the mask and preferably into the interior of the inner oral nasal mask. Sound travels down the tube to the microphone and the signal generated from the microphone is amplified by the electronic circuit, relayed to the speaker and transmitted to the outside of the assembly through an air tight seal.

The use of an amplifier enables the wearer to speak in a normal voice, whilst allowing a sufficiently high output to be generated to make output signal clearly audible. A battery is provided to provide the power supply to operate the amplifier.

The present invention will now be described further, by way of example only, with reference to the accompanying drawings, in which:

Figure 3 illustrates a face mask incorporating a speech facility apparatus according to a first embodiment;

100 Figure 4 is a partially broken away view of the speech facility apparatus of Figure 3;

Figure 5 is a cross-section through a speech facility apparatus according to a second embodiment; and

105 Figure 6 is a circuit diagram of a typical electronic circuit for use with either of the embodiments of Figures 4 and 5.

Referring firstly to Figures 3 and 4, there is illustrated a first embodiment of apparatus for imparting a speech facility to a face mask. The face mask is generally identified as 15 and incorporates an inner oral-nasal mask 17. The speech apparatus is identified by the reference numeral 19 and is shown in further detail in Figure 4. It comprises an air tight casing 21 which has a threaded connection 23 for mating with a correspondingly threaded hole in the face mask 15. This may be a hole already provided in the mask for receiving a sympathetic vibration type of speed transmission device as described with reference to Figures 1 and 2, or it may be provided specifically for use with the apparatus of the present invention. The connection with the mask incorporates a seal to maintain the air tight integrity of the face mask.

A speaker 25 is disposed within the casing 21 and it is covered by an impervious membrane 27 which

provides an air tight seal. The impervious membrane 27 is covered by protective cover 29 which is conveniently provided with perforations. Also disposed within the casing is the electronic circuitry 31 which incorporates an amplifier, an on-off switch 33 for activating and deactivating the apparatus electronics, and a battery 32 providing a source of power for the electronics.

A remote microphone 35 is connected to the electronics of the apparatus by wires 37. The wires are preferably disposed within a screened tube 39. The wires pass out from within the casing 21 by way of a sleeve 41. The exterior of the sleeve carries the screw threaded connection 23. An air tight sound absorbing bung 43 is disposed within the sleeve and the wires 37 and the screening tube 39 pass through this bung. The bung prevents the transmission of unwanted sound waves between the interior of the mask and the rear face of the speaker cone.

Figure 6 illustrates an electronic circuit for use in the apparatus of Figure 4. The output from the microphone 35 is operated on to produce an output signal to drive the speaker 25, i.e. the circuit amplifies the signal from the microphone and relays them to the speaker. Naturally, alternative circuit designs may be used to achieve this objective.

Referring now to Figure 5, there is illustrated a cross-section through an alternative embodiment of apparatus. Like reference numerals have been used to denote the parts corresponding to those used in Figure 4. The apparatus is similar to that illustrated in Figure 4 but has the remote microphone replaced by an internal microphone 35' and a sound transmission tube 51 is employed to convey sound from the mask wearer to the microphone. The sound transmission tube conveniently leads into the inner oral-nasal mask. The microphone 35' is conveniently disposed within the sleeve 41 which incorporates an air tight bung 43 to prevent the unwanted transmission of sound between the interior of the mask and the speaker. The apparatus also accommodates, within the air tight case 21, the electronics 31 and the battery 32 providing the source of power. A switch 33 is provided for activating and deactivating the electronics. The switch 33 projects from the casing, within which it is mounted sealingly, so as to be operable externally by the wearer of the mask. An air tight seal is provided over the speaker 25 by an impervious membrane 27. This is protected by an external end cover 29 which is conveniently perforated. The casing is generally cylindrical and the centre line of the sleeve 41 is conveniently offset from the axis of the casing. However, this is not essential and the two axes may be coaxial. Other shapes and configurations may be employed and the housing of the apparatus may form an integral part of the mask.

The circuit diagram described with reference to Figure 6 is suitable for use in either of the embodiments of Figure 4 and 5. The various components of the electronics are conveniently secured to a printed circuit board. This board conveniently takes the form of one half of an annulus. The apparatus is powered by a 9 volt battery supply.

The electronic speech facility works as follows. In the case of the first embodiment the voice of the

wearer is picked up by the microphone 35 which is placed in the mask and penetrates the oral-nasal mask (Figure 3) and relayed to the speech facility assembly (Figure 4) and amplified by the electronic circuit — (Figure 6), relayed to the speaker 25 and transmitted to the outside of the assembly through an airtight seal 27. The electronic circuit (Figure 6) has the capability of being reduced in size and the whole assembly, circuit or components, being altered in size, shape and layout accordingly, but the principal of the facility remaining the same, an electronic assembly as described, as an integral part of a face mask to reproduce the wearers voice from inside a mask to the outside, the assembly can also be adapted to fit any face mask by altering the means of securing the facility to the mask being used.

This speech facility will satisfy any criteria for gas tightness, water/acid/alkali resistance and intrinsic safety and would satisfy the rules governing the construction and use of breathing apparatus as laid down by the Home Office.

In the case of the second embodiment, the voice of the wearer is transmitted down the sound transmission tube 51 to the microphone 35' which transmits a signal to the electronic circuitry 31 where, when the electronics are activated by operation of the switch 35, the signal is amplified and drives the speaker 25. This causes the air tight membrane 27 to vibrate in sympathy so generating an externally audible sound. The use of electronics incorporating an amplifier enables a clearly audible sound to be generated without the wearer of the mask having to shout.

The described embodiment of apparatus can be detached from the mask for servicing and when attached requires no special operating procedures or restrictions for the operator except for switching the apparatus on and off. Nor is there any loss of time in donning the apparatus.

It is preferred that the microphone or the sound transmission tube extend into the inner oral-nasal mask but this is not essential. The microphone may be positioned in the sleeve and the sound transmission tube omitted in certain circumstances.

#### CLAIMS

1. Apparatus for use with a face mask or the like for imparting a speech facility to the mask, comprising an electronic circuit and a battery, a microphone and a speaker to reproduce the wearers voice from inside a mask to the outside.
2. Apparatus as claimed in claim 1 in which the electronic circuit includes an amplifier.
3. Apparatus as claimed in claim 1 or 2 in which the apparatus comprises a housing which is adapted to be releasably and sealingly secured to a face mask by connection means.
4. Apparatus as claimed in claim 3 in which the connection means comprises a screw threaded connection.
5. Apparatus as claimed in any of claims 1 to 4 in which the microphone is disposed within the face mask and connected to the electronics by wires.
6. Apparatus as claimed in any of claims 3 or 4 in which the microphone is disposed within the housing.
7. Apparatus as claimed in claim 6 in which the wearers voice is communicated to the microphone by

a sound transmission tube which leads into the face mask from the microphone.

8. Apparatus as claimed in any preceding claim in which the speaker is covered by an air tight membrane  
5 which is vibrated in sympathy with the speaker.

9. A method of imparting a speech facility to a face mask or the like using an electronic circuit in conjunction with a battery, microphone and speaker to reproduce the wearers voice from inside the mask to  
10 the outside.

10. A method as claimed in claim 9 in which the wearers voice is amplified by the electronic circuit to drive the speaker and generate a clearly audible sound and wherein the sound from the speaker sets up  
15 sympathetic vibration in an air tight membrane covering the speaker.

11. A face mask or the like incorporating integrally therewith apparatus for imparting a speech facility to the mask comprising an electronic circuit and a  
20 battery, a microphone and a speaker to reproduce the wearers voice from inside a mask to the outside.

12. Apparatus constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing of Figure 3  
25 and 4 or 5.

13. A method of imparting a speech facility to a face mask or the like substantially as hereinbefore described with reference to the accompanying drawings of Figures 3 to 6.